
Principles of the assessment and control of on-site acute health risks from accidental hydrocarbon releases

Guidance for oil and gas facilities, offshore installations and refineries

PRINCIPLES OF THE ASSESSMENT AND CONTROL OF ON-SITE ACUTE HEALTH RISKS FROM
ACCIDENTAL HYDROCARBON RELEASES

GUIDANCE FOR OIL AND GAS FACILITIES, OFFSHORE INSTALLATIONS AND REFINERIES

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1 INTRODUCTION

1.1 BACKGROUND

In the oil and gas industry the major hazard potential of fire and explosion is commonly the principal factor taken into account when:

- designing area monitoring;
- setting alarm levels, and
- planning emergency response procedures for hydrocarbon releases.

The main exceptions are the presence of 'sour' streams containing hydrogen sulphide, or concentrations of individually toxic substances, such as benzene.

The ignition of a flammable gas/vapour cloud typically dominates the risk assessment of large hydrocarbon releases; however, hydrocarbons are also acutely toxic, albeit at high concentration. Fatalities have occurred from over-exposure in industrial accidents and recreational solvent sniffing.

1.2 PURPOSE

This document provides guidance on controlling and mitigating on-site acute health risks arising from accidental hydrocarbon releases, such as large unplanned leaks and plant failure. For consistency with other safety related guidance, this document sets, as far as possible, the necessary controls and actions for health protection in the context of hydrocarbon flammability. It defines the assessment, controls, monitoring and emergency response action that this implies for the control of a major hazard incident.

1.3 SCOPE

In principle the guidance can be applied to any situation with a potential for an accidental release of significant quantities of volatile hydrocarbons. This includes: offshore exploration and production; petroleum refining; bulk storage operations, and large blending and mixing operations.

The following areas are not covered:

- Off-site risks to people or the environment: This document is concerned only with on-site risks and responses, but off-site risks must be covered in the major hazard assessment.
- Breaking containment: purposefully breaking into any lines or plant containing, or previously containing, hydrocarbons has readily foreseeable risks and should be a planned activity. It should be assessed on a job-by-job basis with a task risk assessment and exposure prevented, or adequately controlled, by well-established methods. These include, but are not limited to: permit-to-work controls; isolation; de-pressurising; flushing and venting; de-gassing; purging and draining; closed systems (for example, those used for sampling); enclosure; local exhaust ventilation, and the use of respiratory protective equipment. Offshore COSHH Essentials (OCE)

- (HSE, 2011) provides guidance on good control practice for breaking containment of hydrocarbon and non-hydrocarbon lines and for sampling and pigging. It is also useful for information on specific risks from mercury, process cleaning operations, hydrogen sulphide and naturally occurring radioactive materials (NORM).
- Confined space entry: this is a purposeful activity with readily foreseeable risks and has well established and documented procedural and other controls (HSE 2009, EI 2008).
 - Fugitive emissions: managing these should also be a purposeful activity aimed at minimising and controlling leaks at process/production facilities. Proper routine maintenance of equipment reduces the likelihood of leaks. Routine inspections of process equipment with gas detectors can be used to identify leaks and estimate leak rates for determining appropriate corrective action (EC 2003, EA 2005).
 - Minor spillages: there are many situations where minor spills and releases may occur. These include: laboratory work; sampling and on-site work with hydrocarbon solvents present in coatings; adhesives; cleaners; hose draining. These are purposeful activities where the eight principles of good practice for the control of exposure to substances hazardous to health, and the hierarchy of controls described in UK COSHH guidance are directly applicable (COSHH 2005, HSE 2011). It should be remembered that even small volatile hydrocarbons spillages can be life-threatening in certain circumstances, for example, confined or semi-confined spaces.

This guidance does have some pertinence to the above situations:

- Accidental unplanned releases can occur during planned local breaking containment (for example, from improperly applied procedures and controls or accidental damage to adjacent parts of the system).
- Unplanned releases can occur into occupied confined spaces. When the space is very large (such as hollow columns or legs supporting offshore installations, drainage systems or large process vessels) the resulting health risks to personnel have similarities to a general release on a site or an installation. Also, some aspects of monitoring hydrocarbons for health reasons are pertinent when considering the use of personal monitors in confined spaces.
- Fugitive emissions may indicate poor maintenance routines and hence an increased risk of a major plant/equipment failure.

1.4 APPLICATION

This guidance is for occupational health professionals, occupational hygienists and safety professionals with an interest in and/or responsibilities for managing and controlling health risks in the hydrocarbon industries. In principle, the guidance can be applied to any situation where there is a potential for an accidental release of significant quantities of volatile hydrocarbons. This includes: offshore exploration and production; petroleum refining; bulk storage operations, and large blending/mixing operations.

The guidance will be useful for health professionals involved in the preparation of safety cases and reports, major incident planning and writing workplace procedures. It applies in the UK and on the UK continental shelf (UKCS), but the principles are applicable elsewhere providing local regulations are complied with.